

What is claimed is:

1. An apparatus for electrochemically etching grooves in a working surface, the apparatus comprising:
 - a frame for holding the working surface about an axis and facing a movable electrode movable along the axis, the electrode being axially movable and having a surface carrying a groove pattern to fix on the working surface;
 - a source of electrolyte to be pumped at a fixed static pressure rate between the surface of the movable electrode and the working surface; and
 - a support fixture for supporting the electrode for movement toward and away from the working surface with minimal frictional restriction, and a force biasing the electrode surface toward the working surface so that a gap through which the electrolyte flows between the surface of the movable electrode and the working surface is determined primarily by the static flow rate of the electrolyte and the force bias of the electrode toward the working surface.
2. The apparatus of claim 1, wherein the support fixture comprises a hydrostatic bearing cartridge assembly.
3. The apparatus of claim 1, wherein the bias of the electrode surface toward the working surface is established by pressure against a distal end of the electrode.
4. The apparatus of claim 3, wherein the pressure is caused by a substantially frictionless air cylinder.
5. The apparatus of claim 1, further comprising a source of electric potential to be applied between the electrode and the working surface.

6. The apparatus of claim 5, wherein the electric potential creates a fixed current across the gap so that a rate at which an ECM process is carried out is determined primarily by the gap.
7. The apparatus of claim 1, wherein the working surface is a surface of a counter plate.
8. The apparatus of claim 1, wherein the working surface is a surface of a conical element.
9. The apparatus of claim 1, wherein the electrode comprises a plenum through which electrolyte flows.
10. A method of electrochemically etching grooves in a working surface, the method comprising:
 - holding, via a frame, the working surface about an axis and facing a movable electrode movable along the axis, the electrode being axially movable and having a surface carrying a groove pattern to fix on the working surface;
 - pumping electrolyte at a fixed static pressure rate between the surface of the movable electrode and the working surface; and
 - supporting, via a support fixture, the electrode for movement toward and away from the working surface with minimal frictional restriction, and using a biasing force to bias the electrode surface toward the working surface so that a gap through which the electrolyte flows between the surface of the movable electrode and the working surface is determined primarily by the static flow rate of the electrolyte and the force bias of the electrode toward the working surface.

11. The method of claim 11, wherein the support fixture comprises a hydrostatic bearing cartridge assembly.
12. The method of claim 11, wherein the bias of the electrode surface toward the working surface is established by pressure against a distal end of the electrode.
13. The method of claim 12, wherein the pressure is caused by a substantially frictionless air cylinder.
14. The method of claim 10, further comprising a source of electric potential to be applied between the electrode and the working surface.
15. The method of claim 14, wherein the electric potential creates a fixed current across the gap so that a rate at which an ECM process is carried out is determined primarily by the gap.
16. The method of claim 10, wherein the working surface is a surface of a counter plate.
17. The method of claim 10, wherein the working surface is a surface of a conical element.
18. The method of claim 10, wherein the electrolyte flows through a plenum in the electrode.
19. An apparatus for electrochemically etching grooves in a working surface, the apparatus comprising:
 - means for holding the working surface about an axis and facing a movable electrode movable along the axis, the electrode being axially

movable and having a surface carrying a groove pattern to fix on the working surface;

means for pumping electrolyte at a fixed static pressure rate between the surface of the movable electrode and the working surface;

means for supporting the electrode for movement toward and away from the working surface with minimal frictional restriction; and

means for biasing the electrode surface toward the working surface so that a gap through which the electrolyte flows between the surface of the movable electrode and the working surface is determined primarily by the static flow rate of the electrolyte and a force bias of the electrode toward the working surface.

20. The apparatus of claim 19, wherein the means for biasing the electrode surface toward the working surface is adapted to apply pressure against a distal end of the electrode.

21. The apparatus of claim 20, wherein the means for biasing the electrode surface toward the working surface comprises a substantially frictionless air cylinder.

22. The apparatus of claim 21, wherein the air cylinder is located distally of the electrode.